FOR OFFICIAL USE

C

	KU	PS
Total Mark		

3700/403

NATIONAL QUALIFICATIONS 2008

TUESDAY, 27 MAY
1.00 PM – 2.30 PM

SCIENCE
STANDARD GRADE
Credit Level

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth
Day Month Year

Scottish candidate number

Number of seat

1 Answer as many questions as you can.

2 Read the whole of each question carefully before you answer it.

3 Write your answers in the spaces provided. Showing working may help in some questions.

4 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

1. Some waste gases cause environmental damage.

(*a*) (Circle) the correct answers in the sentences below.

The main cause of the Greenhouse Effect is increased levels of

[carbon dioxide / sulphur dioxide] from burning fossil fuels.

The Greenhouse Effect results in [increased / decreased] heat loss from the Earth.

This causes a rise in [sea levels / skin cancer rates]. **2**

(*b*) Give **one** way of reducing air pollution.

..... **1**

(*c*) The break down of the ozone layer is caused by

A smoke particles

B CFCs

C nitrogen oxides

D water vapour.

Underline the correct answer. **1**

2. Three toxic gases are shown in the box below.

carbon monoxide	hydrogen chloride	hydrogen cyanide

Which of these gases

(*a*) is produced when polyvinylchloride (PVC) burns?

..... **1**

(*b*) prevents the red blood cells from carrying oxygen?

..... **1**

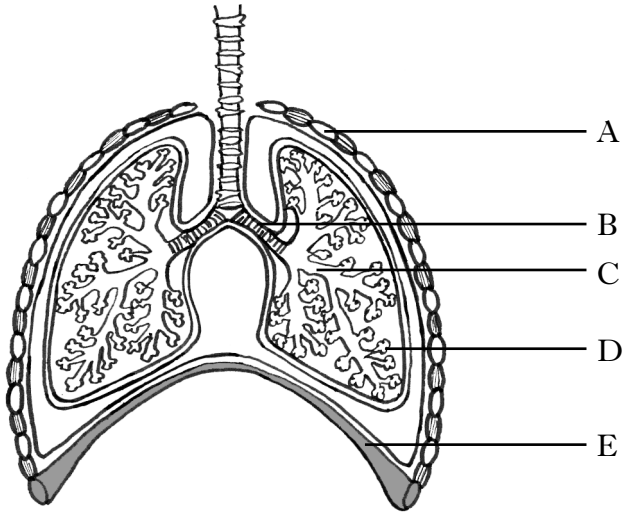
(*c*) damages the nervous system?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

3. The diagram shows part of the human respiratory system.



(*a*) (i) Which letter shows a bronchus?

Letter .....

1

(ii) Which **two** letters show the structures that are involved in changing lung pressure?

Letters ..... and .....

1

(*b*) Different structures in the respiratory system have different functions.

Match each structure to its correct function. The first one has been done for you.

Structure	**Function**
windpipe	produce a sticky liquid that traps dirt
cilia	sweep dirt out of the lungs
air sacs (alveoli)	allows gases to pass in and out of the lungs
cartilage rings	keep windpipe open
mucus cells	allow exchange of gases between lungs and blood

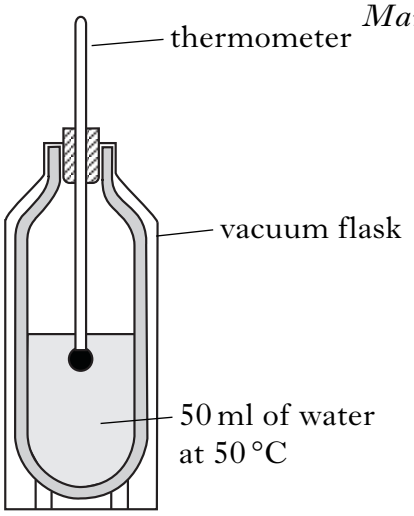
3

[Turn over

KU	PS

Marks

4. Catriona carried out an investigation to compare how well different vacuum flasks kept a liquid hot.



She put 50 ml of water at 50 °C in each of three flasks. After 2 minutes she measured the water temperature and calculated the temperature drop for each flask.

Here are her results.

Vacuum flask	*Temperature drop* (°C)
A	2
B	3
C	2

The investigation was **fair** but could be **improved** to make it more accurate and reliable.

Suggest **two improvements**.

1 .....

.....

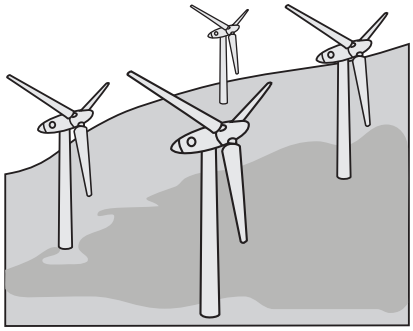
2 .....

..... **2**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

5. Wind turbines are used to generate electricity.



(*a*) One **advantage** of this method of generating electricity is that the energy comes from a renewable source.

Give one other **advantage**.

.....

..... **1**

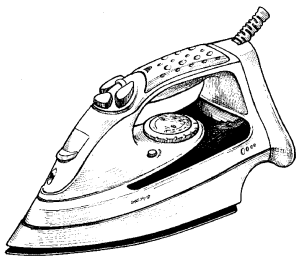
(*b*) One **disadvantage** of this method of generating electricity is that no electricity is produced when there is no wind.

Give one other **disadvantage**.

.....

..... **1**

6. An iron contains a thermostat.



Explain how the thermostat keeps the temperature steady.

.....

.....

..... **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

KU	PS

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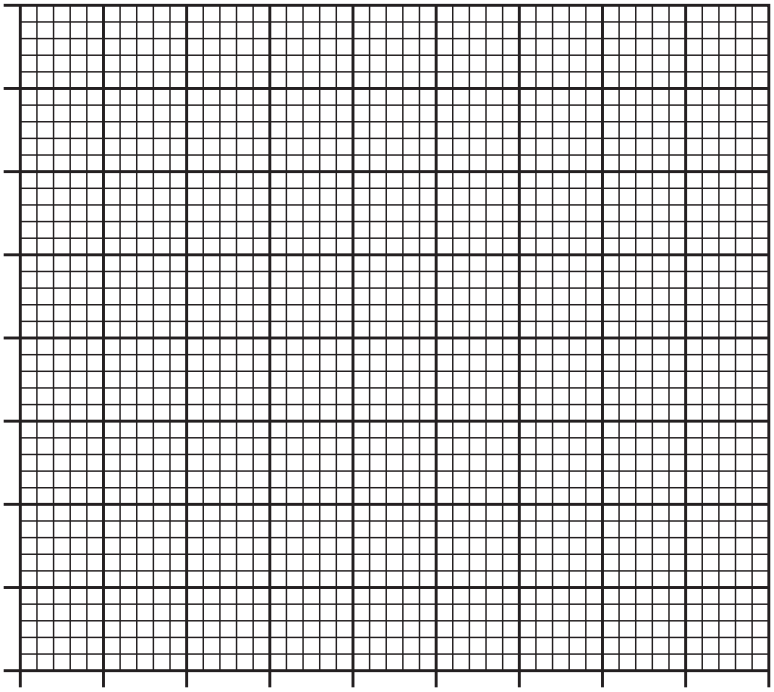
7. The table shows the percentage of electricity generated by nuclear and coal power stations in three European countries.

Country	*Electricity generated* (%)	
	Nuclear	*Coal*
Germany	31	26
Sweden	39	2
UK	28	35

Construct a **single** bar graph to show **all** of this information.
(Additional graph paper, if required, may be found on page 26.)



3

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8. The box shows some properties of materials.

flammability	electrical resistance	resistance to corrosion
strength	electrical conductivity	thermal conductivity
hardness	wear resistance	heat resistance

(*a*) Choose **two** properties which would be **most important** for a material used to make cooking pans.

1 .....

2 ..... **2**

(*b*) Which property fits each of the descriptions below?

(i) The ability of a material to allow electricity to pass through.

..... **1**

(ii) The ability of a material to resist damage caused by impact.

..... **1**

(iii) The ability of a material to support heavy loads without breaking.

..... **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

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9. Read the passage and then answer the questions.

The Phosphorus Cycle

Phosphorus is an element which is essential to both plants and animals. It is needed to form molecules of DNA, make cell membranes and release energy in cells. Animals also need phosphorus, along with calcium and vitamin D, to build up strong teeth and bones.

Like the elements carbon and nitrogen, phosphorous is recycled in the environment. Phosphorus is found in rocks. Erosion by rainfall and running water removes phosphorus from rocks. Plants absorb this phosphorus from water in the soil. When animals eat the plants, the phosphorus passes into their bodies. Decomposition of animal waste and dead organisms returns the phosphorus to the soil. The phosphorus can be absorbed again by other plants. However, most of the phosphorus is carried by rivers into the sea; it sinks to the seabed and is lost from the cycle until it forms rocks again.

Too much phosphorus can be an environmental pollutant. Phosphorus fertilisers are washed into rivers and lakes. As a result, the number of water plants increases sharply. This causes the oxygen level to fall and animals in the water cannot survive.

In humans, too much phosphorus can cause damage to the brain, bones, teeth and kidneys. In the past, some people working in factories who were exposed to high levels of phosphorus developed a disease called "Phossy Jaw". The jaw bone absorbed so much phosphorus that it became swollen and crumbled away. Nowadays, the amount of phosphorus used in manufacturing processes is carefully controlled.

(*a*) Name the **three** substances animals need to build up strong teeth and bones.

1 .....

2 .....

3 ..... **2**

(*b*) Name **two** elements which, like phosphorus, are recycled in the environment.

1 .....

2 ..... **1**

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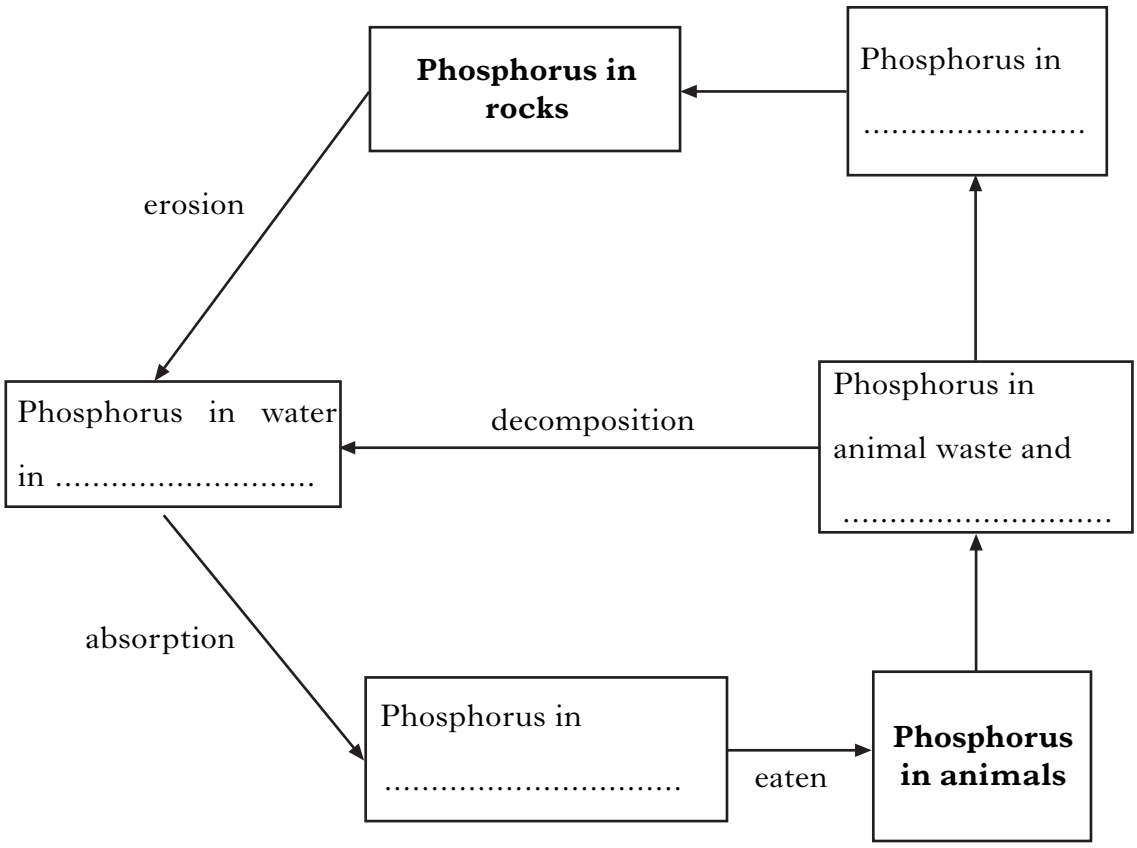
9. (continued)

(*c*) Use the information in the second paragraph to complete the diagram of the phosphorus cycle.



2

(*d*) Explain why animals cannot survive in lakes which are polluted by too much phosphorus.

.....

..... **1**

(*e*) Describe what happened to factory workers suffering from "Phossy Jaw".

.....

..... **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

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10. Alcohol abuse, smoking and eating too much fatty food can cause health problems.

(*a*) Many people who drink too much alcohol develop health problems.

Describe one effect **on the body** of regularly drinking too much alcohol.

..... **1**

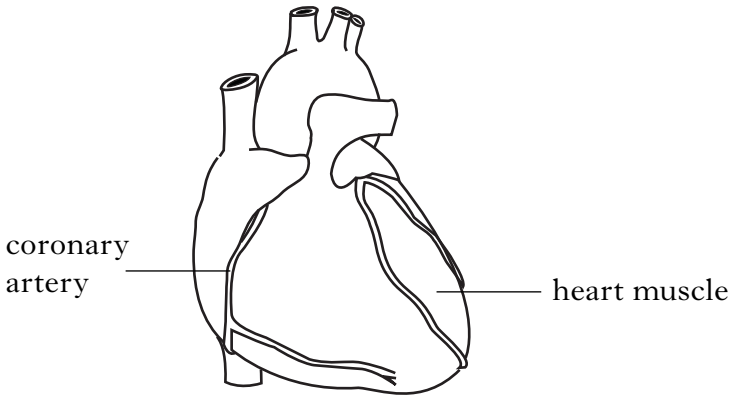
(*b*) (i) Name the substance in tobacco smoke which reduces gas exchange in the lungs.

..... **1**

(ii) Name the substance in tobacco smoke which is addictive.

..... **1**

(*c*) A heart attack can be caused by a lack of food and oxygen getting to the heart muscle. This causes heart muscle cells to die.



Explain why eating too much fatty food increases the risk of a heart attack.

.....

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

11. The food chain below is from a grass field environment.

grass ⟶ beetle ⟶ shrew ⟶ weasel

(*a*) Energy is lost at each stage in a food chain.

For example, the shrew uses up some energy to keep warm and this energy is not passed on to the weasel.

Give **one other** way in which the shrew uses up energy.

..... **1**

(*b*) In April, the grass was sprayed with low levels of pesticide.
Months later, the weasel was found to have high levels of pesticide in its body.

This is because the weasel

A ate the grass

B ate lots of beetles

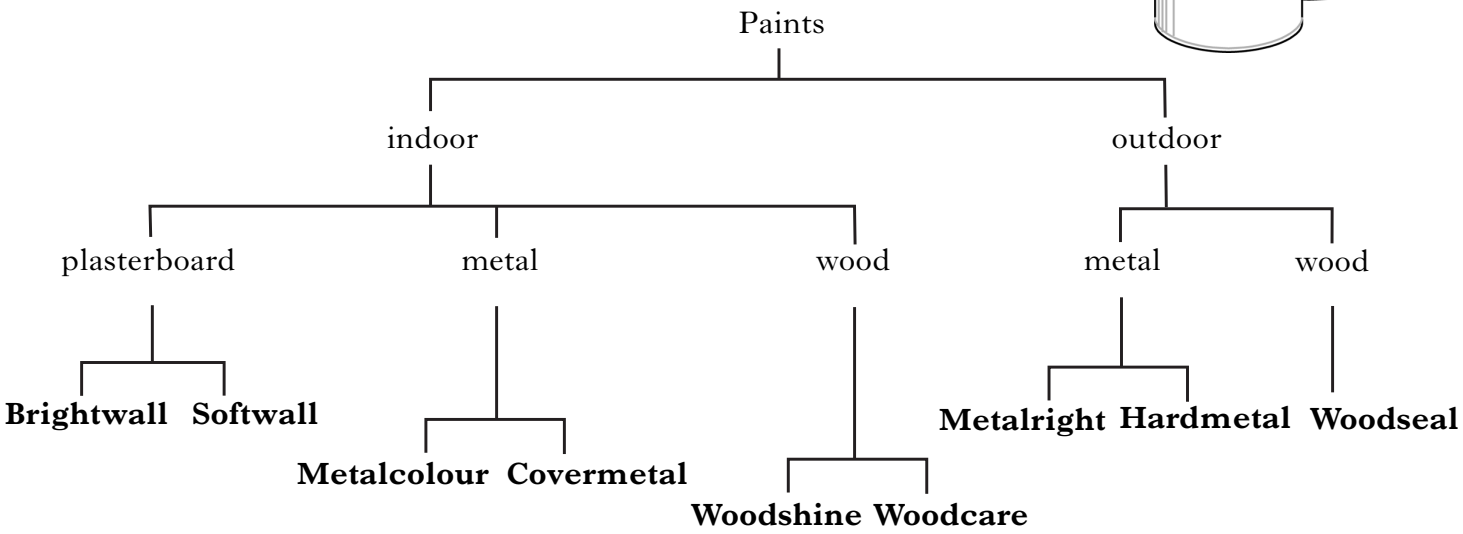
C breathed in the pesticide when the grass was being sprayed

D ate lots of shrews which had eaten lots of beetles.

Underline the correct answer. **1**

[Turn over

12. The key shows information about the uses of different paints.



The table shows the type of finish available for each paint.

Paint	*Type of finish*					
	Matt	*Eggshell*	*Gloss*	*Metallic*	*Satin*	*Silk*
Brightwall	✓	✓			✓	
Covermetal		✓				
Hardmetal			✓	✓		
Metalcolour			✓	✓	✓	
Metalright			✓			
Softwall	✓					✓
Woodcare						✓
Woodseal			✓		✓	
Woodshine			✓			

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

12. (continued)

(*a*) What types of finish are available in the paint for use on outdoor wood?

..... and **1**

(*b*) Which paint would you use to give gloss finish to an indoor metal radiator?

..... **1**

(*c*) Softwall paint can be used **indoors** to give a **silk** or **matt** finish on **plasterboard**.

List **all** the information given about Hardmetal paint.

.....

..... **2**

13. (*a*) Which of the following is a **population** of organisms?

A All the insects in a garden

B All the red squirrels in a pine forest

C All the flowering plants in an open field

D All the fish in a loch

Underline the correct answer. **1**

(*b*) Which of the following would **not** limit the growth in size of a population?

A Flooding a valley to create a reservoir

B A deadly disease spreading through the area

C Lava pouring out and down the sides of a volcano

D Regular emptying and filling up of a rock pool by the tide

Underline the correct answer. **1**

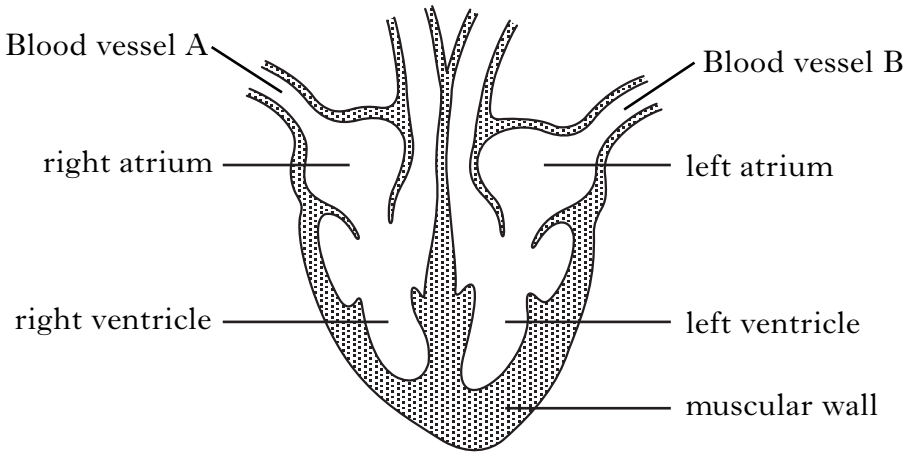
[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

14. The diagram below shows a section through the human heart.

Two blood vessels and four heart chambers are labelled.



(*a*) (Circle) the correct word in each box.

Blood in vessel A contains [more / less] oxygen

and [more / less] carbon dioxide than blood in vessel B. **1**

(*b*) Explain why the muscular wall of the left ventricle is thicker than that of the right ventricle.

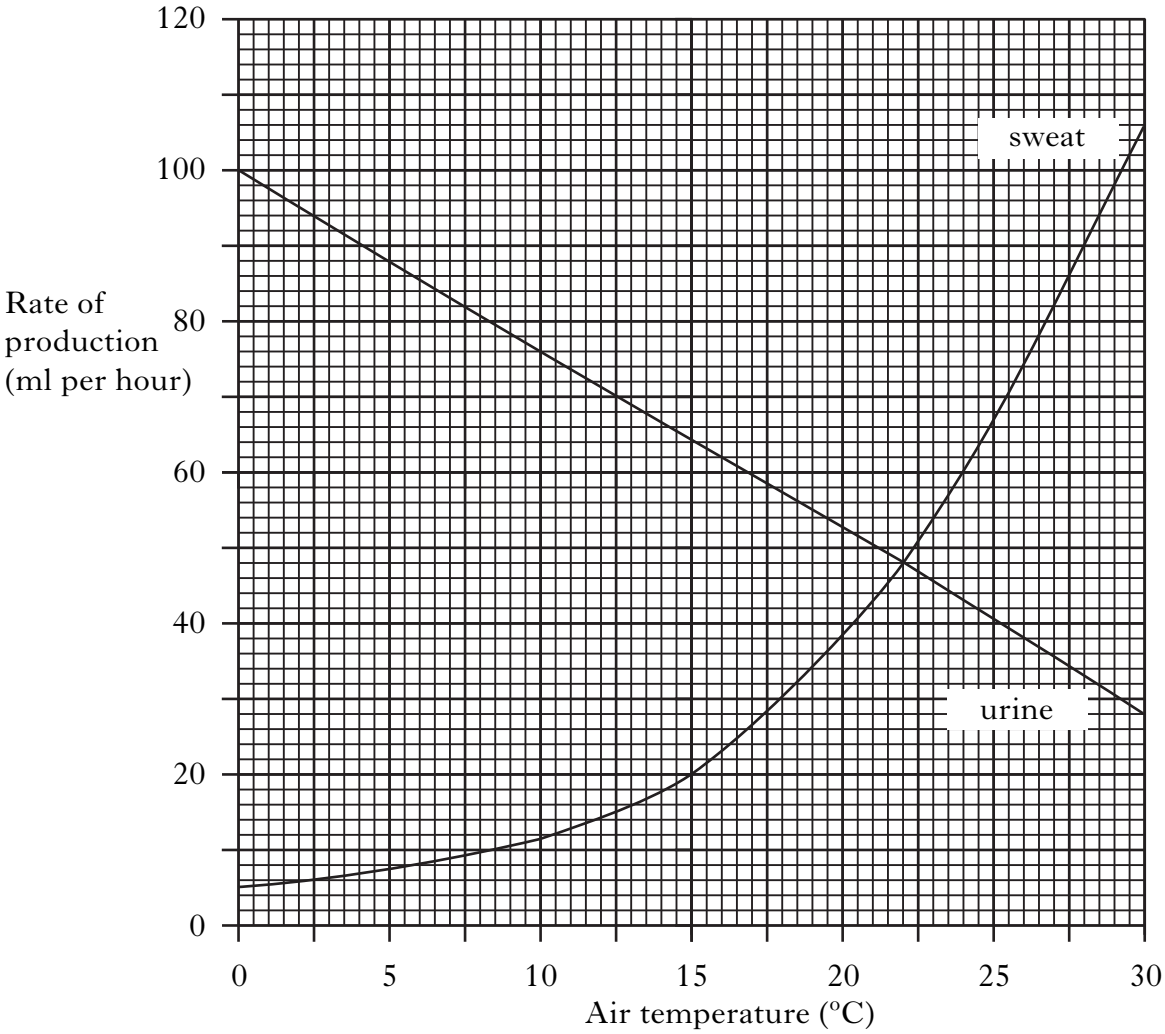
.....

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

15. The line graph shows the effect of air temperature on a person's rate of sweat production and urine production.



(*a*) Draw **two** conclusions from the graph

1 .....

.....

2 .....

..... **2**

(*b*) At what air temperature is the rate of sweat production the same as the rate of urine production?

..... °C **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

16. Different methods of protecting materials against damage are shown below.

anodising	pesticide treatment	waterproofing
packaging	galvanising	electroplating

Which method would be **most appropriate** to protect

(*a*) an aluminium ladder?

..... **1**

(*b*) a TV during transport?

..... **1**

(*c*) the steel hull of a ship?

..... **1**

(*d*) wooden rafters in a loft?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

17. In an experiment two identical flasks were wrapped in fur. One flask had the fur facing inwards and the other had the fur facing outwards. Both flasks were filled with water at 90 °C. The temperature of the water was measured every 5 minutes.

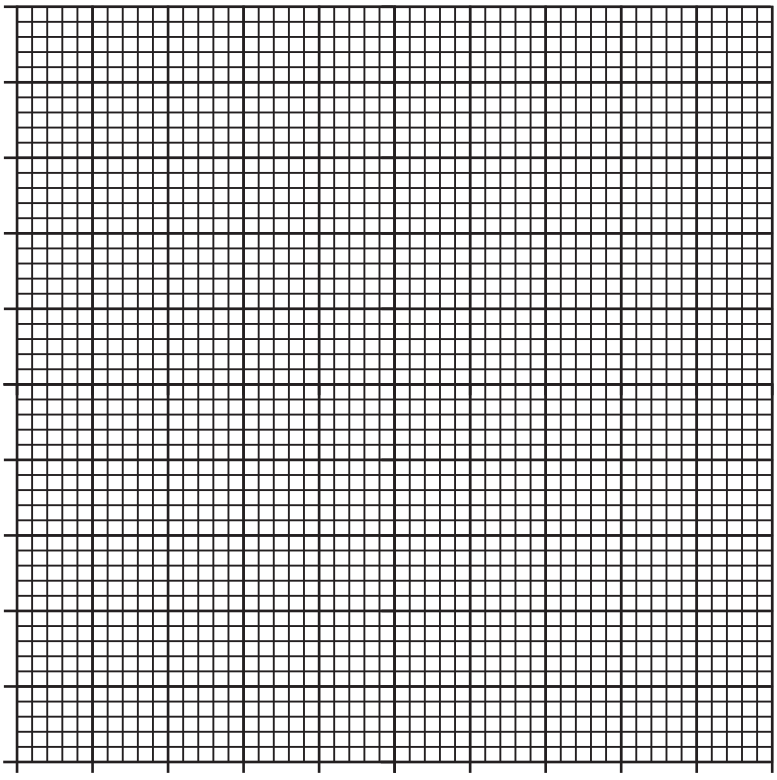
The results are shown in the table.

Time (minutes)	*Temperature of water* (°C)	
	Fur facing inwards	*Fur facing outwards*
0	90	90
5	72	65
10	55	44
15	41	29
20	32	22
25	25	20

(*a*) Using the **same axes**, show the results as two line graphs.

Label each line clearly.

(Additional graph paper, if required, may be found on page 26.)



Time (minutes) **3**

(*b*) Predict the temperature of the water after 12 minutes in the flask with the fur facing inwards.

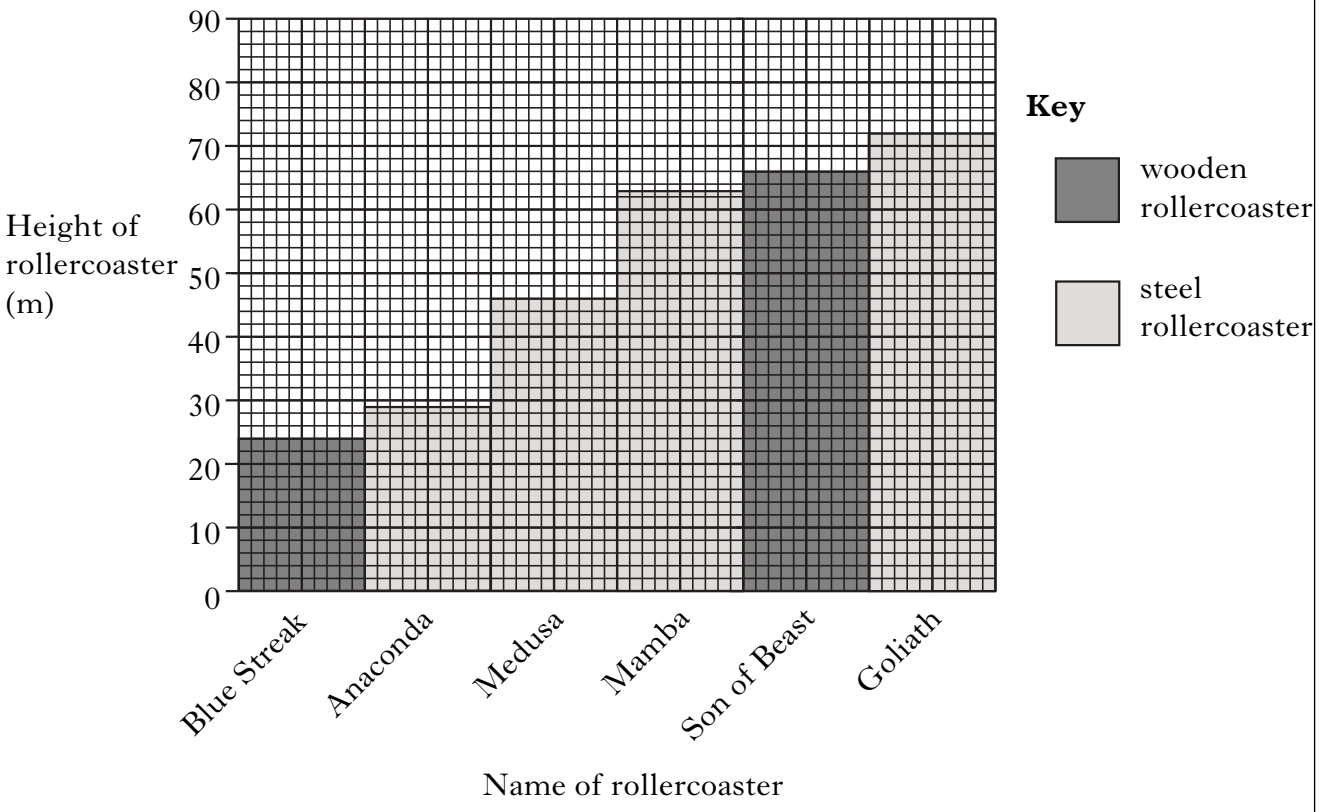
.....°C **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

18. The table and graph below show some information about rollercoasters.

Name of rollercoaster	*Speed* (km/h)	*Length* (m)
Blue Streak	64·4	779·7
Anaconda	80·5	823·0
Medusa	104·6	1200·0
Mamba	120·7	1706·9
Son of Beast	126·0	2143·4
Goliath	136·8	2371·6



(*a*) What is the length of the rollercoaster which is 29 m high?

..... m **1**

(*b*) What is the height of the rollercoaster which is 2143·4 m long?

..... m **1**

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

18. (continued)

(*c*) What conclusion can be drawn about the height and speed of a rollercoaster?

.....

..... **1**

(*d*) What is the average height of the **steel** rollercoasters?

Space for working

Answer..... m **2**

19. The names of some gases are shown in the boxes below.

1 carbon dioxide	2 carbon monoxide	3 ozone
4 CFCs	5 oxygen	6 sulphur dioxide

(*a*) Which box shows a gas that causes acid rain pollution?

Box number **1**

(*b*) Which box shows the gas formed by incomplete combustion of petrol in a car engine?

Box number **1**

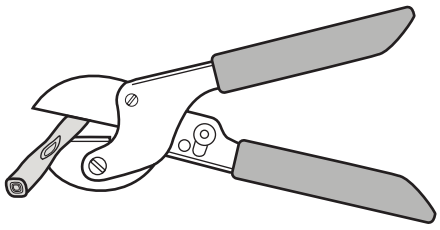
[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

20. Pruning shears are used by gardeners to cut through small branches.

The force that pruning shears exert on the branch can be calculated using the relationship shown below.



$$\text{force on branch} = \frac{\text{force applied to handles} \times \text{distance from handles to pivot}}{\text{distance from branch to pivot}}$$

Calculate the force on the branch which is 3 cm from the pivot, when a force of 20 N is applied to handles which are 15 cm from the pivot.

Space for working

Answer ..... N **2**

21. The names of some processes are shown in the boxes below.

1 radiation	2 oxidation	3 fermentation
4 distillation	5 conservation	6 compression

Which box shows the process by which

(*a*) sugar is converted into alcohol?

Box number **1**

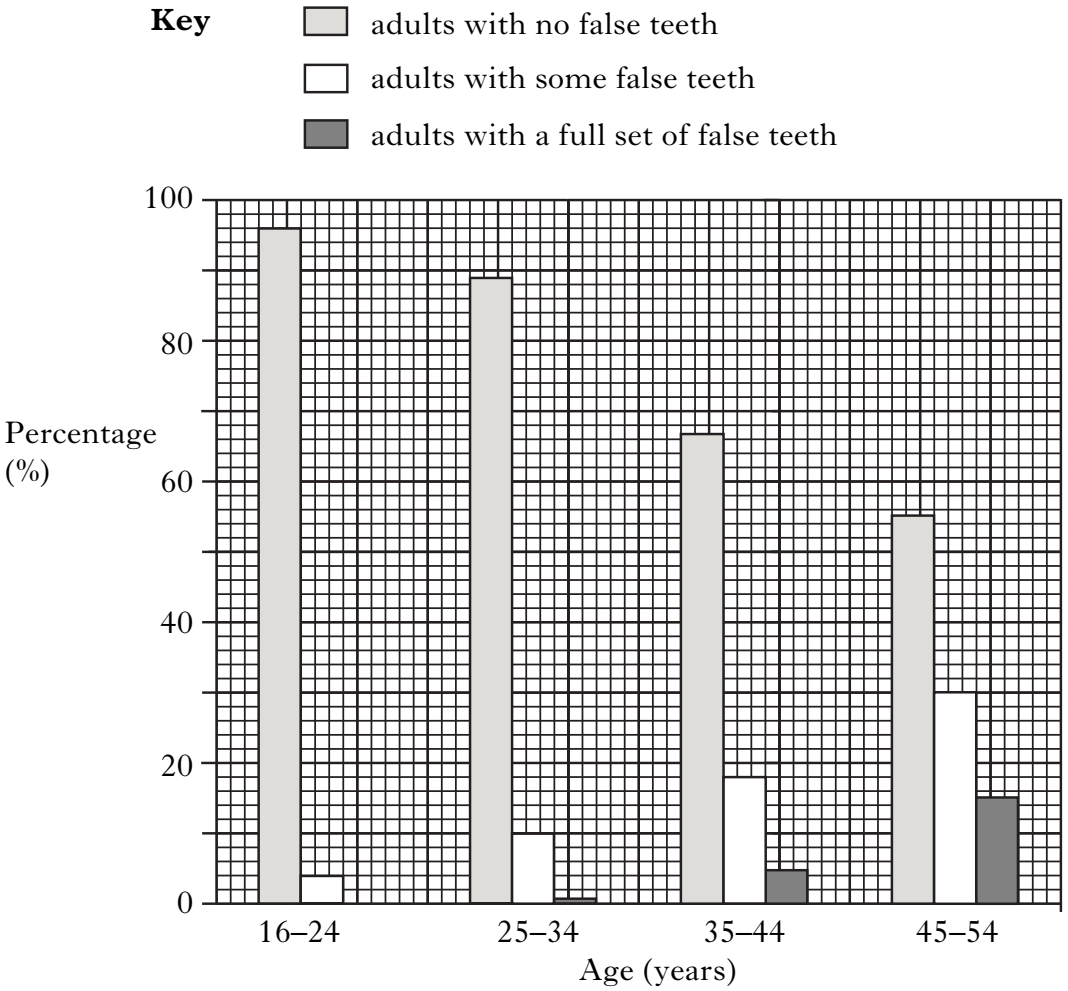
(*b*) crude oil is separated into more useful products?

Box number **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

22. Information about the dental health of adults was obtained in a Scottish Health Survey.



One conclusion that can be drawn from this information is:

"As age increases, the percentage of adults with a full set of false teeth increases."

Draw **three** other conclusions from the information.

1 .....

.....

.....

2 .....

.....

.....

3 .....

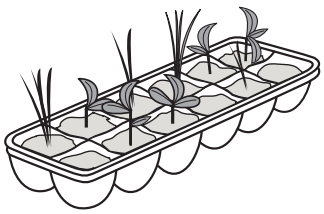
.....

..... **3**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

23. Plants need certain conditions before they will grow well.

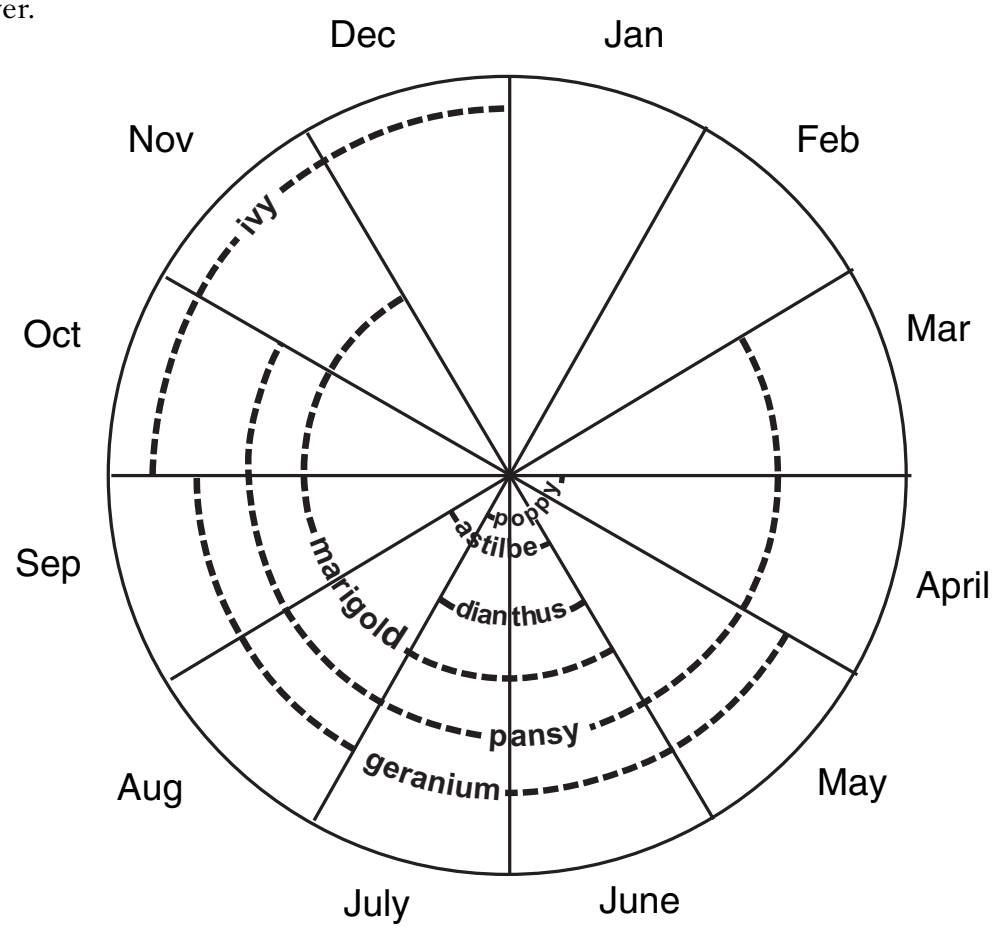


The table shows the best growing conditions for some plants.

Name of plant	*Light needed for flowering*	*Soil pH range*
Ivy	●	6·0–7·5
Geranium	◑	6·0–8·0
Pansy	○	5·5–6·5
Marigold	○	5·5–7·0
Dianthus	◑	6·0–7·0
Astilbe	●	6·0–8·0
Poppy	○	6·0–7·5

○ = Full Sun ◑ = Sun or Shade ● = Shade

The diagram below shows the months of the year during which these plants flower.



DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

23. (continued)

(*a*) Which soil pH would be suitable for all the plants?

pH 5·5 pH 6·0 pH 7·0 pH 7·5

(Circle) the correct answer. **1**

(*b*) Which two plants flower in May and need full sun?

Plants ..... and **1**

(*c*) Which plant can flower in sun or shade, could grow in a soil pH of 7·0 and is in flower in August?

Plant **1**

(*d*) One of the plants shown has a soil pH range of 6·0–7·5 and flowers from October to December.

The light needed for flowering is

○ Full Sun

◑ Sun or Shade

● Shade

Underline the correct answer. **1**

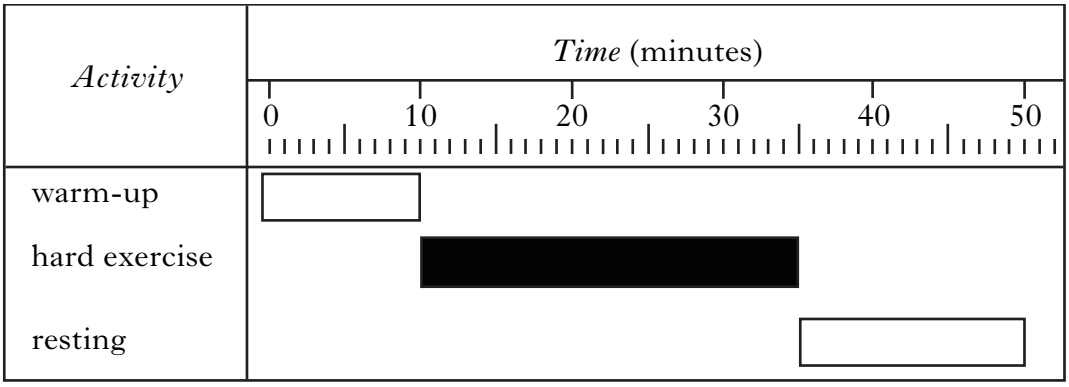
[Turn over

DO NOT WRITE IN THIS MARGIN

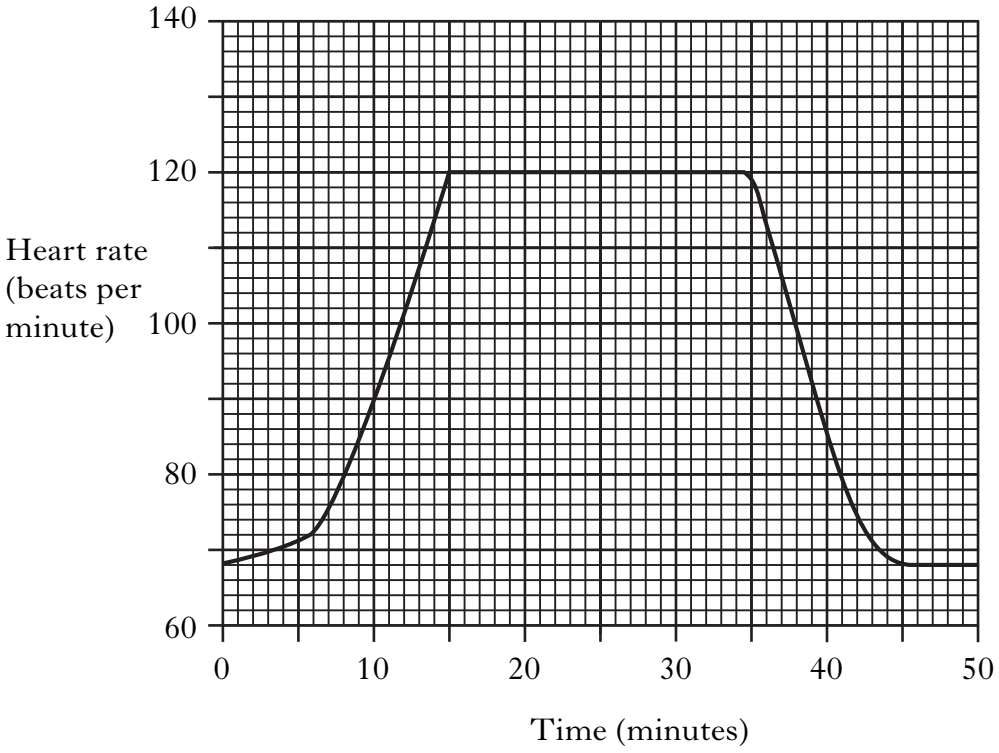
Marks	KU	PS

24. Lorne took part in a fitness training session.

The chart shows Lorne's training session times.



The graph below shows how her heart rate changed during the session.



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24. (continued)

(*a*) (i) Calculate the increase in Lorne's heart rate during **warm-up** time.

Space for working

.....beats per minute **1**

(ii) Calculate the percentage increase in Lorne's heart rate during **hard exercise** time.

Space for working

.....% **2**

(*b*) Two waste products build up in the body during exercise.

Carbon dioxide is the waste product which builds up in the blood.

(i) Name the waste product which builds up in the muscles.

..... **1**

(ii) What name is given to the period of time, after exercise stops, during which this waste product is removed from the muscles?

..... **1**

[*END OF QUESTION PAPER*]

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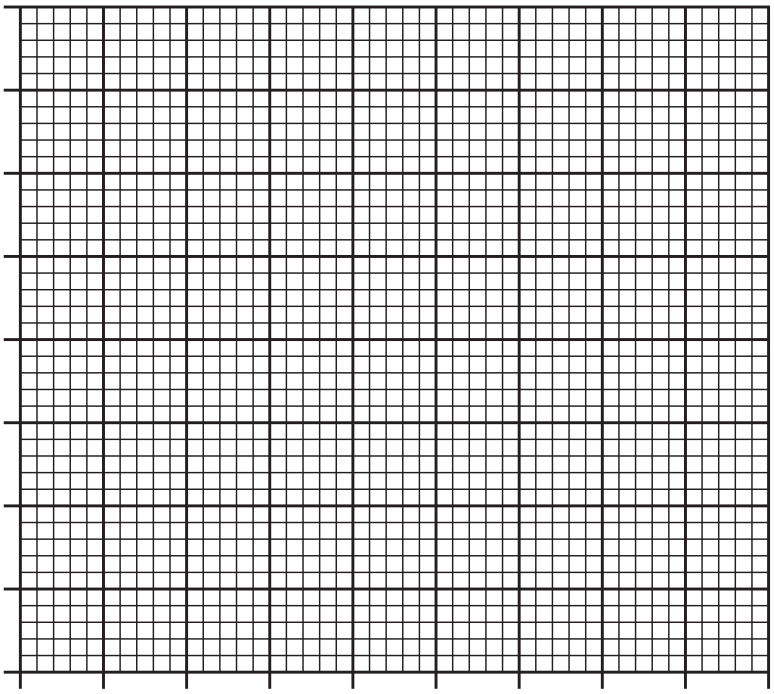
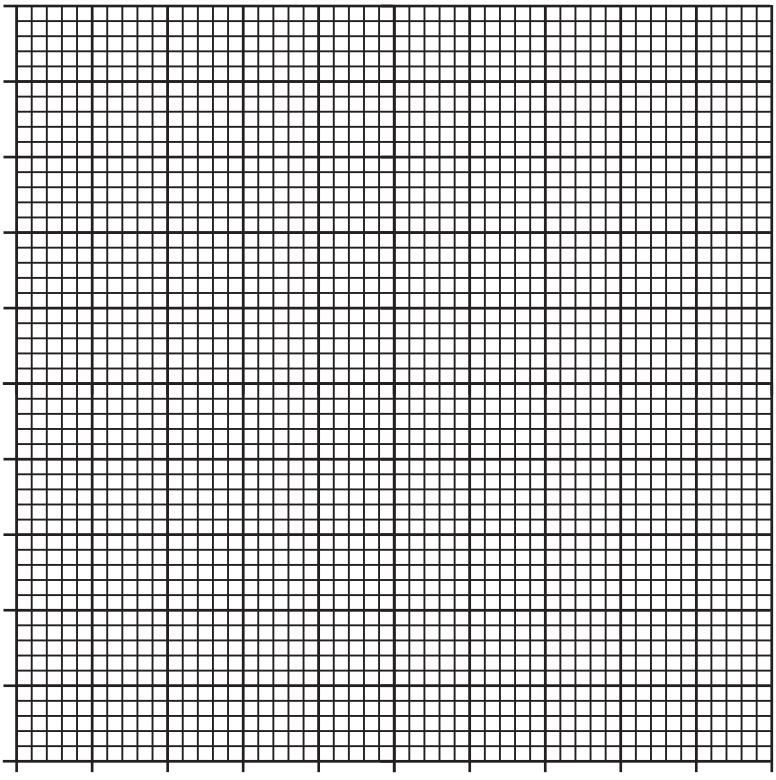
ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 7



ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 17(*a*)



Time (minutes)

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